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## ThumbNail & Analysis

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ThumbNail Web page:

<http://www-d0.fnal.gov/~serban/thumbnail>

# ThumbNail Overall Structure

## 1. Chunk history information

- ChunkID's of parent Chunks and their parents
- RCPID's of reconstructors

## 2. Chunk structure information

- number of chunks of given type
- number of objects from a given chunk

## 3. Object information

- Packed contents
- Indices to related objects

## Parent Chunks

- D0PhysObj Chunks (can be treated uniformly):
  - ChargedParticleChunk
  - EMparticleChunk
  - MuonParticleChunk
  - TauChunk
  - JetChunk
  - MissingETChunk
  - bcJetChunk
- VertexCollChunk
- FPSClusterChunk
- CPSClusterChunk
- LinkedPhysObjChunk (*not written out, re-generated at unpacking*)

All parent chunks can be fully restored from Thumbnail except that:

FPSClusterChunk, CPSClusterChunk have only associated clusters.

VertexCollChunk have no GTrack links.

GTrack links replaced by ChargedParticle links in a new chunk: VtxChLinksChunk.

What is missing:

- Only trigger information is list of triggers fired
- MC information written out but not packed  
need a new MC chunk

## ThumbNail Files

ThumbNail files will reside on disk and store enough information/event for most analysis. The plan is to have all events on disk in ThumbNail format.

File Content:

- Event
- HistoryChunk
- ThumbNailChunk
- TMBTriggerChunk
- MCKineChunk (for MC)

Present size for  $t\bar{t}$  events with 0 mbias:

8kb/event

**dropping MCKineChunk & Provenance**

edm Provenance overhead is 4Kb/event

MCKineChunk 25Kb/event

Thumbnail files will be generated by **D0reco\_x**

## Implementation Details

Two packages:

- **ThumbNailPkg** :  
framework package for packing
- **UnpThumbNailPkg** :  
framework package for unpacking
- **ThumbNailChunk** (all physics information)  
For each object type store:
  - **vector<list<ChunkID>>**: a list of parents from each original parent chunk.
  - **vector<list<RCPID>>**: a list of RCPID's for each original parent chunk.
  - **vector<vector<TmbObj>>**:  
Each class inheriting **D0PhysObj** has a corresponding class inheriting **TmbObj**. All persistent attributes except links are copied to **TmbObj**. Links are converted to indices (**8 bit unsigned integers**).
  - **TmbObj** object compression with **d0om** commands.

## Analysis with ThumbNail Files

**TMBAnalyze\_x** program available in t02.12.00.  
Includes package to unpack thumbnail files

It can be used to generate either root tuple or root tree.

### Drawbacks of root tuple:

- root tuple files x3 size of ThumbNail files.
- great deal of duplicate information
- No standard links between objects
- root tuple structure only vaguely follows event structure
- does not exploit root as an object oriented analysis tool

### root tree:

Still under development, almost complete. Each edm object and each LinkIndex will have a corresponding TObject and TRef.

TMBAnalyze\_x has 3 packages to generate the root tree:

- mc\_analyze/TMBMCTreePkg: create MC makers of root objects
- tmb\_tree/TMBCorePkg: create makers of root objects corresponding to objects in ThumbnailChunk
- tmb\_tree/TMBTreePkg: fill the root tree

Programs to generate a root tree should be managed by each physics group and should be made adding a physics package to TMB-Analyze\_x.

We expect root tree files to be bigger(x2?) than Thumbnail files. Not all events in Thumbnail files should be duplicated in root tree files.